



MATH JUNIOR

ROBOTICS FOR KIDS (AGE 7-16 YEARS)



Robotics for Kids | Ranjitha Gopalkrishna

STEAM BASED SKILL DEVELOPMENT AND LEARNING COMPANY



Creativity for life time

STEAM BASED SKILL DEVELOPMENT AND LEARNING COMPANY



MATH JUNIOR INDIA

PRESENTS



“ROBOTICS FOR KIDS”

THE STARTER KIT





ABOUT MATH JUNIOR

MATH JUNIOR is a STEAM based Skill Education and Online Learning Institute focuses on enabling children to think and adapt to the next generations of intellectuals. We are registered online educational consultant firm and a STEAM based skill development and training company.

MISSION

Our Mission is to promote and provide life skill-based value-added education system to every child and help them to achieve development and success from very young age. We are inspired by our beloved leaders Swami Vivekananda and Dr. A. P. J Abdul Kalam who are live in our hearts. Our mission is to work for their goals.

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VISION

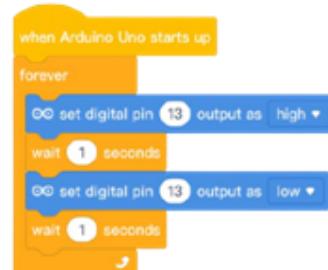
Our vision is to become the best educate provider and to develop young children to outstanding level on concepts. Our long-term continuous vision is to become the best online educate service provider in the field of Mathematics and STEAM by creating young innovators.

LITTLE INNOVATOR'S GUIDE



Unleash the innovator in you as you:

1. Unlock the doorway of **Electronics**
2. Explore the land of **Code Blocks**



A perfect companion for escaping into the adventurous world of BOTS!

Let's begin the journey in **3, 2, 1... NOW!**

Creativity for life time
**PRACTICE, PARENT SUPPORT AND PUNCTUALITY ARE
VERY MUCH IMPORTANT FOR STUDENT'S PROGRESS.**

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WHY ROBOTICS FOR KIDS?

- ✓ Learning Robotics makes you stand out from crowd whether in your school or anywhere with a clear cut practical understanding of the subject.
- ✓ Prepares students to be technologically literate and confident through self-directed learning and abstract thinking. Develop in-depth conceptual understanding through hands-on training that incorporates practical application of Engineering, Science & Technology.
- ✓ Learning different concepts ranging from solving real world Engineering problems through ideation, design & proto-typing.
- ✓ Students can participate with innovative ideas and models in various Science fairs or Science Exhibitions.
- ✓ Helps students to develop their skills on Project management and team work through DIY assignments.
- ✓ Prepares students to work on the future technologies such as Artificial Intelligence (AI), Internet of Things (IoT), 6th Sense Technology, Machine Learning and Advanced Robotics.
- ✓ Robotics Helps Children to Build Machines with intelligence, Helps with Logical Design, Make them Creative, Improve Problem Solving and Analytical Thinking.



WHAT'S IN THE KIT?

1. Arduino UNO R3		-----	1
2. Servo motor		-----	1
3. BO motors (Dual)		-----	2
4. Acrylic chassis		-----	1 pair
5. Caster wheel		-----	1
6. Wheels		-----	2
7. Ultrasonic sensor		-----	1
8. PIR Motion sensor		-----	1
9. Sound sensor		-----	1
10. Smoke sensor		-----	1
11. IR Proximity sensors		-----	2
12. Flame sensor		-----	1
13. Bluetooth module		-----	1

14. Buzzer		-----	1
15. Switch		-----	1
16. Jumper wires			
Male to Female		-----	25
Male to Male		-----	10
Female to Female		-----	10
17. LED lights		-----	2
			
18. Rechargeable battery (9V)		-----	1
or			
Recharger		-----	1
Battery holder		-----	1
Battery (3.7v)		-----	2
Model: 18650-1800 mAh			
19. Screws & Nuts		-----	1 Set
20. Resistor 1K ohm		-----	1
21. Mini water pump with pipe		-----	1



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3. Sound Detection Alarm System
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6. Black Line Follower
7. Obstacle Avoiding Robot
8. Bluetooth Controlled LED Light
9. Bluetooth Robotic Car
10. Fire Fighting Bot

1. INTRODUCTION

ROBOT AND ROBOTICS

A **robot** is an automated machine that does tasks without the help of a person. It replaces human effort. Robots can only do what a person has built them to do. It can be operated automatically or manually.



A robot may or may not resemble humans in appearance. Robots assist human beings in their daily activities and operations.

By extension, **robotics** is a discipline dealing with the design, construction, testing and operation of robots. The goal of robotics is to design machines that can help and assist humans.



A re-programmable, multi-functional manipulator designed to move material, parts, tools, or specialized devices through various programmed motions for the performance of a variety of tasks. Robotics is an interdisciplinary branch of Engineering and Science which includes the application of Electrical, Electronics, Mechanical and Computer Science to design, construct and operate Robot

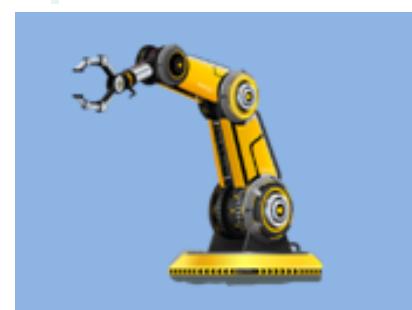
USES OF A ROBOT

Robotics has very wide scope of learning, development of a Robot includes the following process such as physical construction, robot control, components used, computer control, sensors, navigation and information processing.

Different types of Robot include Manual Robot such as Wired & Wireless Robot, Autonomous Robot such as Vision Bot, Pre-programmed & Self-Learning Robot. The applications of Robotics include Industrial Robots, Medical Operating Robots, Swarm Robots, UAV Drones, Nano Robots, Home Robots, Self-Driven Cars, Military Robots, Ping-pong playing Robot and much more.

Robots are useful because they can complete a task in a much faster way than humans, without any down time and help. They can be more accurate, cost saving and time saving. Robots can work in environments which are unsafe for humans.

In short, robots can increase productivity, efficiency, quality and consistency of products. Robots are used widely all over the world. Some of its major uses are as follows:



- 1 Robots are used in factories.
- 2 They are used in alarm systems.
- 3 They can be sent deep underwater or into space.
- 4 Robots can also handle dangerous materials such as radioactive waste or harmful chemicals.
- 5 They can dispose bombs or do spy work for the military.
- 6 Robots are widely used in medical field to perform minimally invasive surgeries, to assist a doctor, reading patient's vitals etc.



did YOU. know?



SOPHIA – THE ROBOT

Sophia is a social humanoid robot developed by Hong Kong - based company Hanson Robotics. She has participated in many interviews just like humans!

Sophia imitates human gestures. She can answer your questions based on predefined topics!



She has skin, legs and she can walk!

She can make facial expressions!

She can wink, laugh, get angry and lots more!

Sophia is the world's first robot citizen. She personifies our dreams for the future of AI. As a unique combination of science, engineering, and artistry, Sophia is simultaneously a human-crafted science fiction character depicting the future of AI and robotics, and a platform for advanced robotics and AI research.



Sophia visited India in 2020 to attend a technology-based session in Kolkata.

What Sophia says...

I can estimate your feelings during a conversation.
I have my own emotions too!
Recently I have learnt a new skill – to Draw!

Know more: <https://www.hansonrobotics.com/sophia/>



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2. THE ELECTRONIC STOREHOUSE

Let us see the detailed description of each component in the kit.

WHAT IS ARDUINO?

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor or a finger on a button - and turn it into an output - activating a motor or turning on an LED.

You can tell your board what to do by sending a set of instructions to the microcontroller on the board. This is done by writing the code in Arduino programming language on the mBlock or Arduino IDE platform.

Arduino is the brain of the system. You write the code and upload it to the robot's brain so that it can work.

ARDUINO UNO R3

A0 to A5 – Analog pins

0 to 13 – Digital pins

GND – Ground pin

3.3v & 5v – Voltage supply

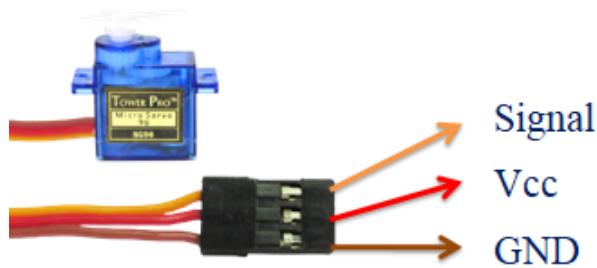
Rx (D0) – Receiver

Tx (D1) – Transmitter

(3, 5, 6, 9, 10, 11) – PWM pins ('~' sign)



SG – 90 SERVO MOTOR



Servo motor initiates rotary motion and causes the sensor head to turn left or right.

(in our project, we use servo motor to rotate ultrasonic sensor head)

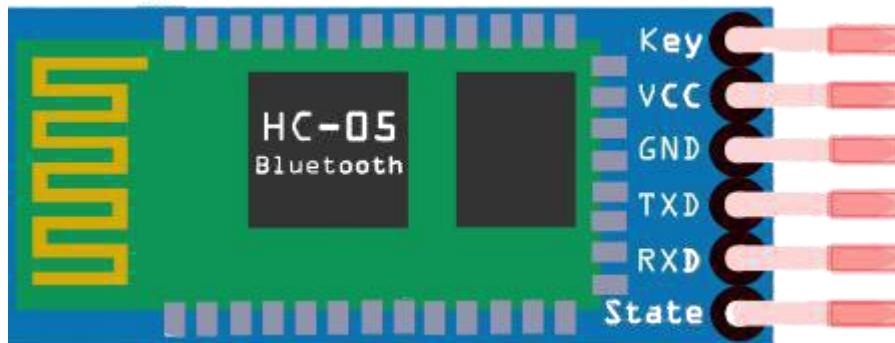
Signal - Connected to analog / digital pin of arduino. The pulse signal determines the amount of movement or rotation.
Vcc - +5v supply
GND - Ground

WHAT IS BLUETOOTH?



Bluetooth is a short range wireless technology used to receive and transmit data to mobile phones, computers, laptops and other gadgets. It can establish wireless communication between devices within a range of **10 meters**.

Bluetooth Module HC-05



Vcc – Voltage supply +5V

GND – Ground

TXD – Transmits signal to the device

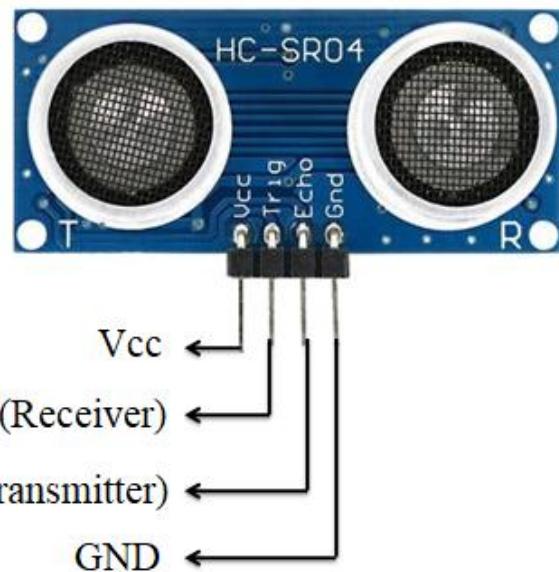
RXD – Receives signal from a connected device

Key – Enable pin

State – 0 or 1

Ultrasonic Sensor HC-SR04

An ultrasonic sensor is an instrument that measures the distance to an object using ultrasonic sound waves.



Transmitter (trig): Transmits sound waves to detect an object in front of it.

Receiver (echo): Receives reflection of sound waves if an object is present. Otherwise it does not receive any signal.

Vcc : +5v

GND : Ground

MQ – 2 SMOKE / GAS SENSOR

A **smoke sensor** is a device which detects the presence of smoke in the surrounding atmosphere. On sensing smoke, the detector emits a loud, high – pitched alarm tone.

This takes smoke as a primary indication of fire, to warn people in case of fire in the building.

MQ-2 sensor can detect gases like Methane, Butane, LPG and smoke.



D0 – Digital pin

A0 – Analog pin

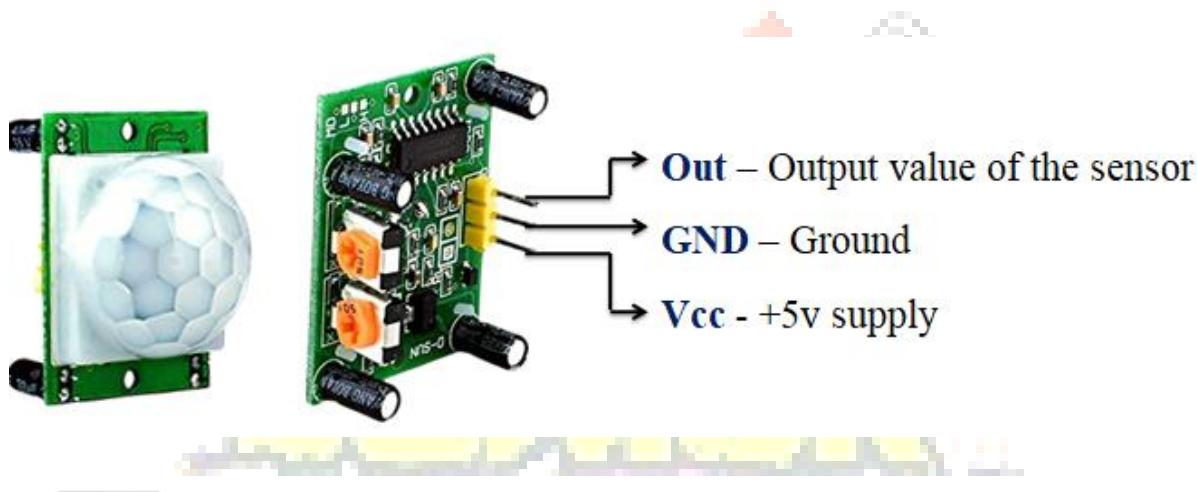
GND – Ground

Vcc - +5v supply

PIR MOTION SENSOR

Pyroelectric (Passive) Infrared Sensor –

PIR sensor allows you to sense motion. It is used to detect whether a human or an object has moved in or out of the sensor's range.



Motion sensors are used widely in alarm systems, hand dryer machines, automated sink taps and automatic doors.

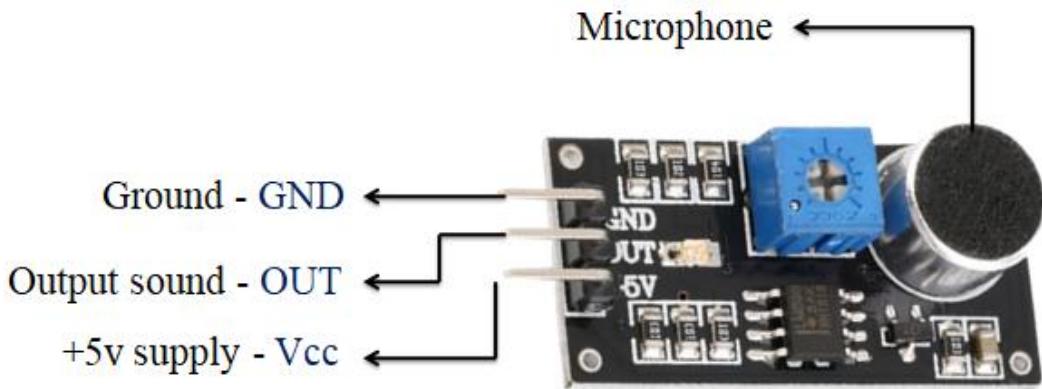
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LM393 SOUND SENSOR



Sound is made of sound waves or air vibrations. Louder sounds produce larger vibrations. Sound sensor is embedded with a microphone.

Whenever a sound is made above a given threshold, the microphone identifies the sound signal through the vibrations in the air.



Sound sensors are widely used in burglar alarm systems, door alarms and majorly home automation such as lighting your house by detecting whistle / clap instead of physically turning the light switch.

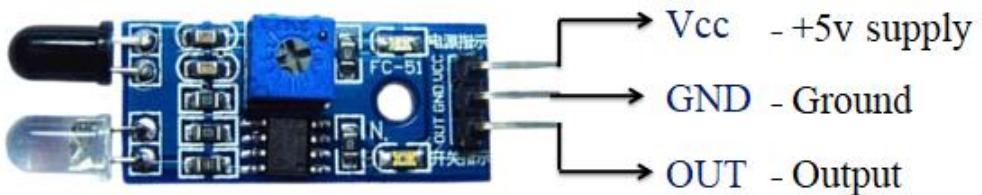
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Infrared (IR) SENSOR

Creating for life time

An infrared sensor is an electronic device that emits infrared light rays in order to sense some aspects of the surroundings. An IR sensor can be used as a black line follower. It can also measure the heat of an object.



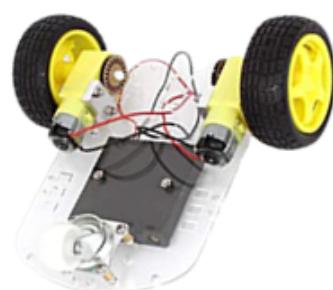
IR sensor can be used to measure temperature of human body. It is widely used in radiation thermometers.



The line follower robot is used in factories to carry and transport huge loads.

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DC MOTORS & L293D - MOTOR DRIVER



On supplying power, DC motor starts rotating. It is in turn connected to wheels of the robot. (1 DC motor is used for 1 wheel). This DC motor causes the wheels to rotate and movement of the robot is achieved. These DC motors are Battery operated (BO).

In order to rotate , the DC motors need some power (voltage supply). This is achieved by connecting motors to a motor driver - L293D.



JUMPER WIRES

Jumper wires are used to make circuit connections on the arduino board. There are 3 types of jumper wires:



Male to Male



Female to Female



Male to Female

Creativity for life time

LED (LIGHT EMITTING DIODE) – 5 mm

LEDs are small, powerful lights that are used in many different applications. It is as simple as turning a light on and off.

A typical LED light is shown here. It has a long leg and a short leg. Long leg (+) is supplied with Voltage and short leg (-) is connected to the Ground.

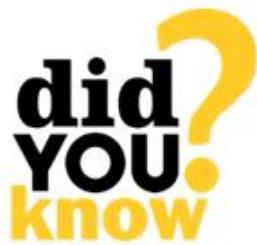


RESISTOR – 1 K Ω

The **resistor** is the part of an electrical circuit that resists, or limits, the power of an electrical current in a circuit. It also helps to reduce, or lessen the amount of electricity moving through the circuit.



This is a $1\text{K}\Omega$ Resistor that we use in our projects along with the LED to control the flow of current in the circuit.



MARS – CURIOSITY ROVER



Curiosity is a car – sized rover designed by NASA to explore the Gale crater on Mars.

Launch: 26 November 2011

Curiosity has successfully completed **8 years** on Mars and is still active!

Curiosity rover gets a boost from artificial intelligence !

The use of artificial intelligence (AI) in space exploration instead of human commands sent all the way from Earth, saves precious mission time and has boosted the speed at which the Mars Curiosity rover gathers data.



The main scientific goals of this mission are to help determine whether Mars could ever have supported life, as well as determining the role of water, and to study the climate and geology of Mars. The mission results will also help prepare for human exploration.

Know more: https://mars.nasa.gov/#red_planet/2

3. THE LAND OF CODE BLOCKS

ABOUT mBLOCK



mBlock is a STEAM programming software tool designed for programming for kids. It is developed based on Scratch 3.0 and Arduino code. It supports block-based and text-based programming languages.

You can start coding in mBlock by downloading the software and installing it. However, you can directly use it without downloading by visiting the mBlock webpage. If you're using mBlock webpage, you need to download mLink first. Both the methods are described below.

Method 1:



mBLOCK - 5 SOFTWARE INSTALLATION

Download mBlock 5 for PCs

mBlock 5 can run on Windows and Mac OS.



OS Requirements

Windows 7.0 or later; Mac OS X or later

Quick Installation

1. Visit <https://www.mblock.cc/en-us/download> to download.
2. Double-click the installation file and follow the installation wizard.
3. After the installation is complete, mBlock 5 icon is displayed on desktop.

Method 2:



M – BLOCK WEBPAGE (without downloading)

mBlock 5 Webpage and mLink Quick Start Guide

You can also use mBlock 5 on the web without downloading it.

mBlock 5 webpage: <https://ide.mblock.cc>

To connect a device to mBlock 5 on the webpage, you need to install mLink first.

mLink Quick Start Guide

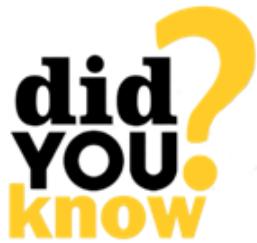
Preparation for Installation

PC system : Windows 7 or later, macOS 10.10 or later

mBlock 5 webpage: <https://ide.mblock.cc>

Quick Installation

1. Download mLink [mLink-Windows installation package](#)
2. Open the installation file and follow the installation wizard.
3. After the installation is complete, the mLink icon is displayed on the desktop and the toolbar in lower right corner.



MITRA & MITRI



The robot is developed by **Invento Robotics**, a Bangalore based company. These robots can be used in Banks, Hospitals, Malls, Restaurants etc!

Recently, Mitra the robot is found to be helping COVID patients in India speak to loved ones.



Creativity for life time



Its eyes are equipped with AI facial recognition technology to help it recall people it has previously interacted with.

Mitra can be a doctor's assistant, take readings and vitals, remind them of medications & lots more!



The robot is best known for interacting with Prime Minister Narendra Modi at an event in 2017. Mitra has thrilled some of the biggest leaders and celebrities of the world

Know more: <https://mitrrobot.com/>

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4. PROJECTS

In this chapter, let us see in detail the purpose of each project by making its circuit connections, working, testing and deploying them.

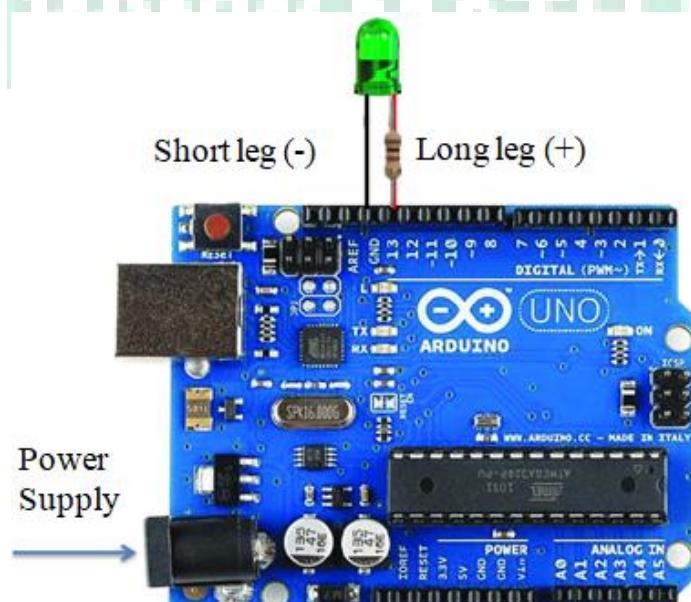
1. ARDUINO BLINK – The Starter Project

This is a basic project for beginners. You will learn about the pins on the Arduino UNO board. The purpose of this project is to demonstrate the blinking of an LED light as the arduino is supplied with power.

COMPONENTS

- Arduino UNO R3
- Power supply
- LED 5 mm
- Resistor 1K ohm

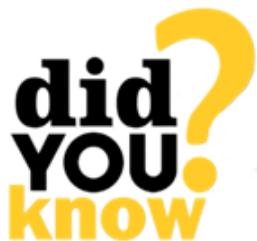
CIRCUIT DIAGRAM



Connections	
LED -ve	To Arduino GND
LED +ve	To 1K Resistor
1K resistor	To Arduino pin 13

WORKING

- Supply the circuit with power.
- The LED light connected to pin 13 will be ON for 1 second.
- The light then goes OFF for 1 second.
- This ON and OFF happens forever in a loop demonstrating the blinking of the LED.

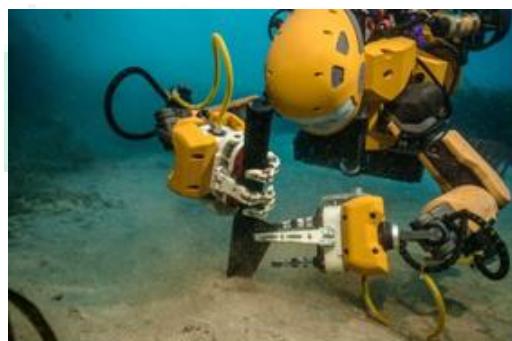


OCEAN ONE



OceanOne is a “**Robotic Mermaid**” created by Stanford to study and explore coral reefs deep in the Red Sea.

It lets humans explore deep under the Ocean’s surface, without any of the dangers or time limits associated with diving.



OceanOne collects samples from shipwrecks. It is controlled by haptic joysticks, letting its operators feel the lightness or heaviness of whatever object it's holding, thus giving researchers a much more hands-on feel.

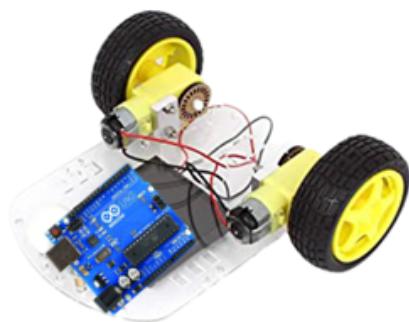
Know more: <https://www.popsci.com/humanoid-robot-can-dive-deep-underwater-exploring-reefs-and-shipwrecks/>

2. DC MOTOR ROTATION & SPEED CONTROL

The DC Motors that we use here are battery operated geared motors with dual functionality. It can rotate forward as well as backwards. This project shows the basic connections of the motors, motor driver and wheels. You will also see how to control the speed of these motors using PWM pins on the arduino.

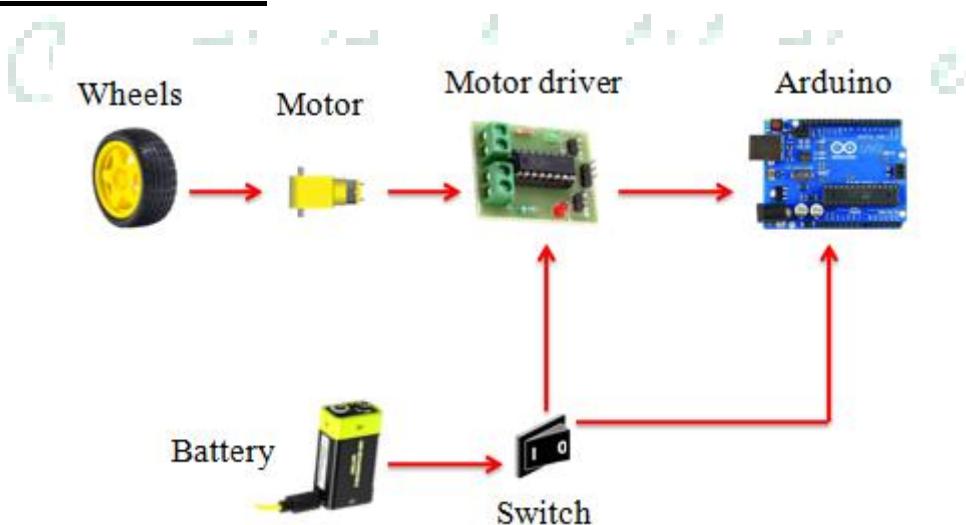
COMPONENTS

- Switch
- Motor driver L293D
- DC motors
- Acrylic chassis
- Screws and nuts
- Jumper wires
- Battery
- Arduino UNO
- Wheels

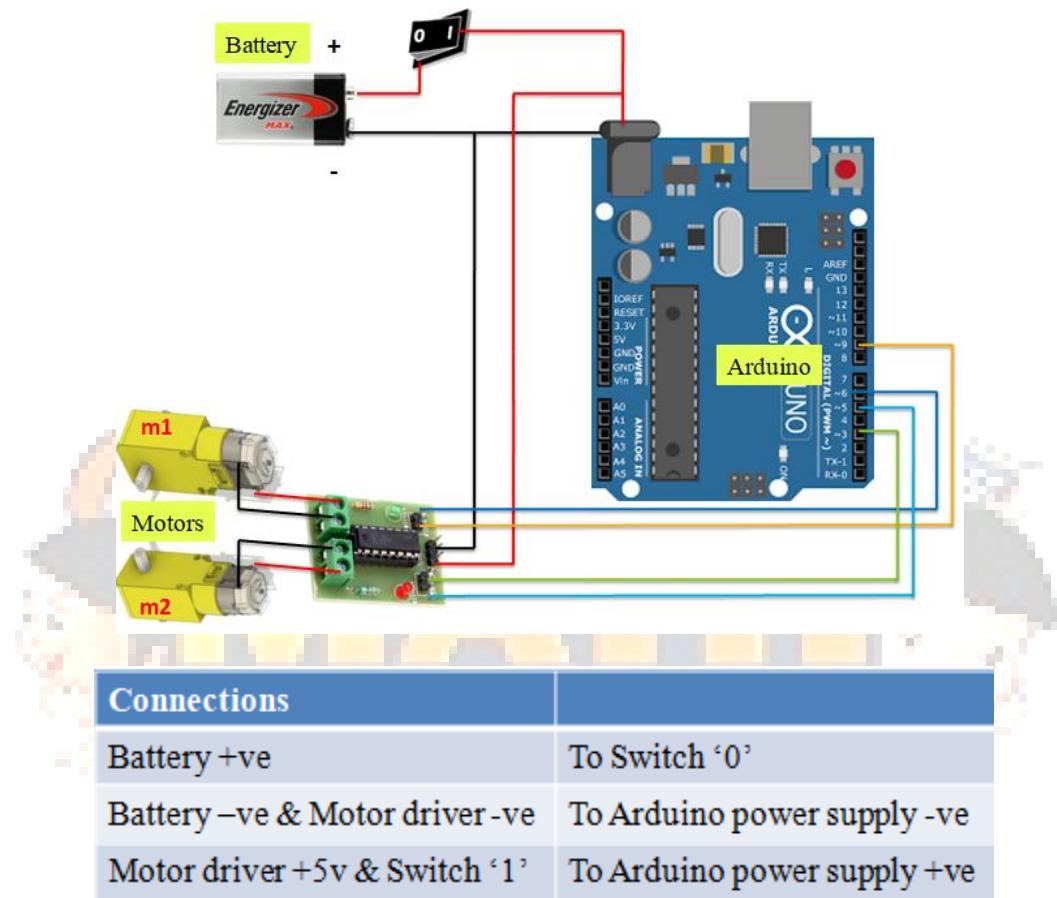


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BLOCK DIAGRAM



CIRCUIT DIAGRAM



Motor driver Pin	Arduino Pin
M1 'a'	To D6
M1 'b'	To D9
M2 'a'	To D3
M2 'b'	To D5

WORKING

- Make the connections as shown in the figure above.
- Make sure the motor connections are made with PWM pins of the arduino. PWM pins allow us to control the speed of the motor. (Observe that 3, 5, 6 and 9 all are PWM pins here)
- To make the motors move forward, arduino pins D6 and D3 must be HIGH; D9 and D5 must be LOW.
- To make the motors move backward, D6 and D3 must be LOW; D9 and D5 must be HIGH.

3. SOUND DETECTION ALARM SYSTEM

The **LM393 sound sensor** is a module used to notice the sound. Sound sensors can be used for a variety of things. One of them could be turning lights off and on by clapping. In this project we are going to build an alarm system in which the buzzer will make loud beeps when a sound is made above threshold value.

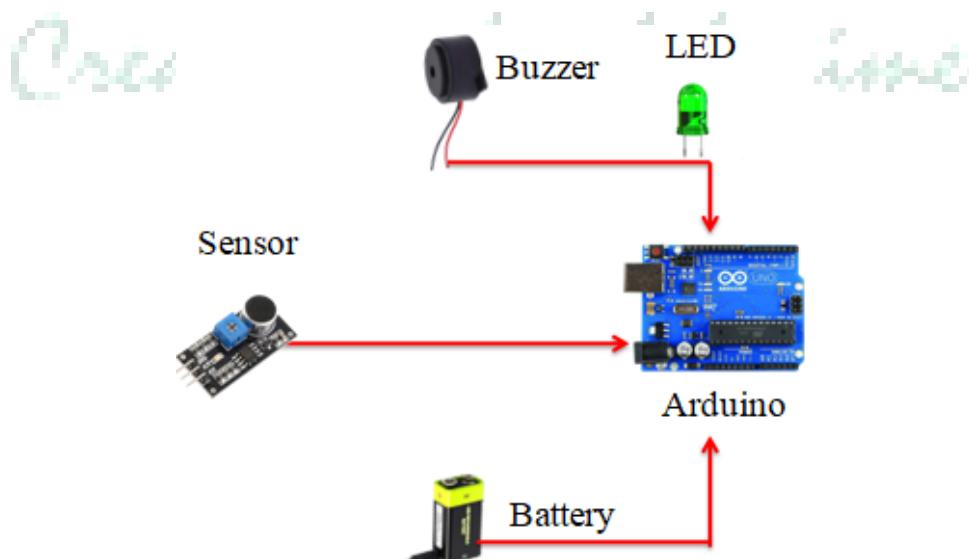
These sound sensors are inexpensive, easy to interface with and are able to detect sounds of voice, claps or door knocks.

COMPONENTS

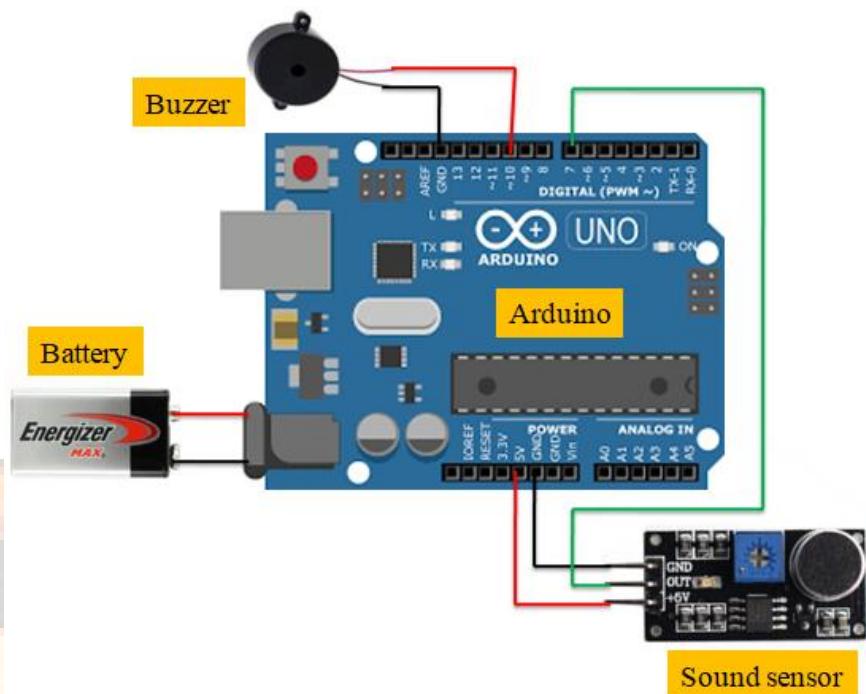
- Arduino UNO
- Buzzer
- LM393 sound sensor
- Battery
- Jumper wires
- mBlock



BLOCK DIAGRAM

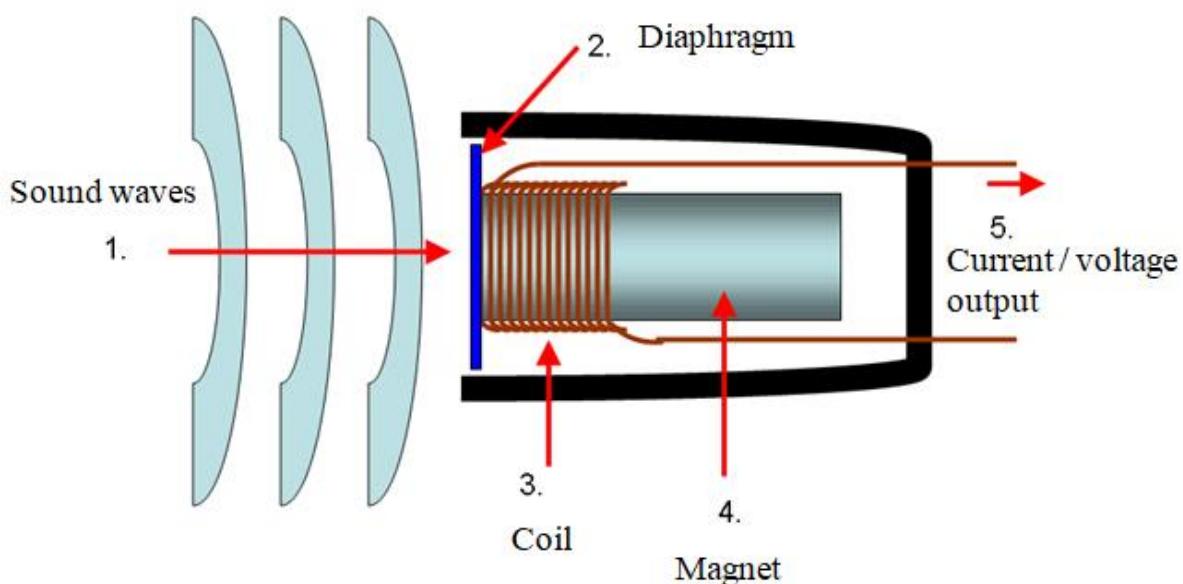


CIRCUIT DIAGRAM



Sensor Pin	Arduino Pin	Buzzer	Arduino Pin	LED	Arduino Pin
OUT	To D7				
GND	GND	GND	GND		
VCC	+5V	+5V	To D10		

WORKING



How does the sensor work?

When sound waves hit the diaphragm (blue line in the figure), the magnet vibrates inside the microphone. There is a coil around the magnet. Whenever magnet vibrates, it touches the coil and current is produced.

NO SOUND -> NO VIBRATION -> NO CURRENT -> NO ALARM

- Make the circuit connections as shown and supply it with power.
- The sound sensor will not produce any voltage if there is no external sound.
- When a sound above a certain threshold is made, the magnet in the microphone vibrates; this gives an output voltage.
- Arduino receives the output voltage and if it is greater than threshold, the buzzer starts beeping.

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4. SMOKE / GAS DETECTOR

The MQ-2 smoke sensor is sensitive to smoke and to the following flammable gases: LPG, Butane, Propane, Methane, Alcohol and Hydrogen.

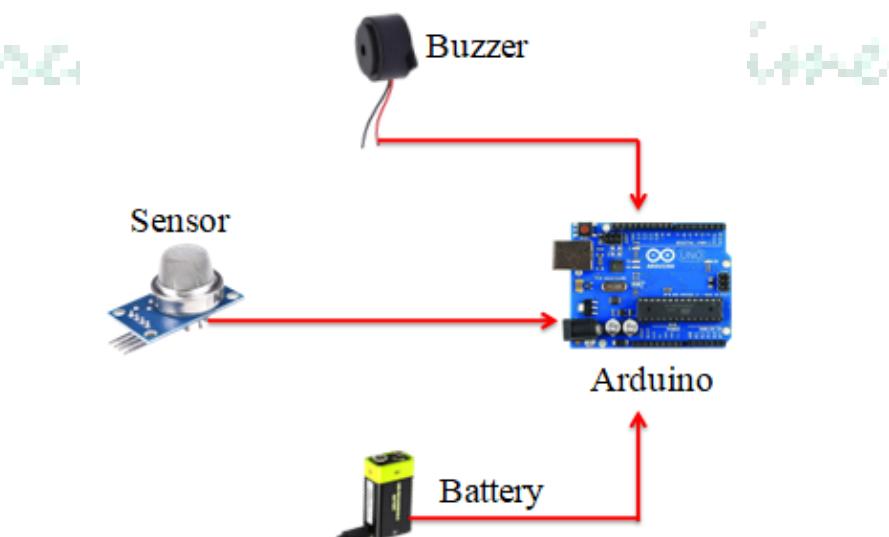
The resistance of the sensor is different depending on the type of the gas. The smoke sensor has a built-in potentiometer that allows you to adjust the sensor sensitivity according to how accurate you want to detect gas.

COMPONENTS

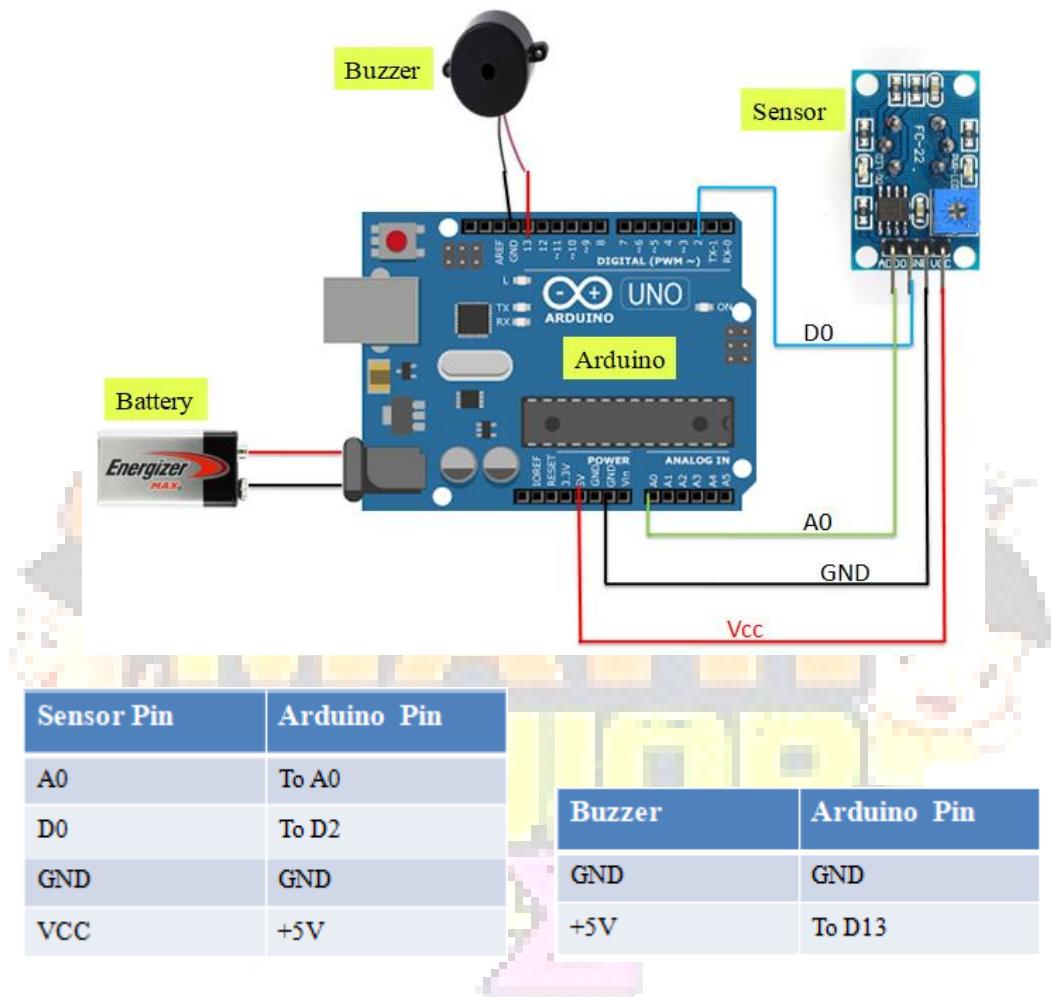
- Arduino UNO
- Buzzer
- MQ-2 Smoke sensor
- Battery
- Jumper wires
- mBlock



BLOCK DIAGRAM



CIRCUIT DIAGRAM



WORKING

How does the sensor identify smoke / gas?

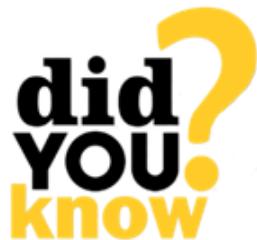


The output value (voltage) of the sensor changes accordingly with the smoke/gas level that exists in the atmosphere.

- Supply power to the circuit by connecting the battery.
- The sensor will sense the smoke or gas level in the atmosphere.
- If this value is more than the threshold value, the buzzer starts beeping. You can adjust the sensitivity/threshold value of the sensor accordingly.
- If the value becomes less than the threshold, buzzer will stop beeping.



Creativity for life time



DRDO - DAKSH, INDIAN MILITARY



Daksh is an electrically powered and remotely operated vehicle (ROV) used for locating, handling and destroying hazardous objects safely.

Daksh serves bomb disposal units (BDU) of the army, police and paramilitary forces.

Daksh can detect and diffuse bombs. It can withstand blast impacts too!



Daksh is equipped with portable X-ray device to determine whether an object is hazardous or not.

It has a shotgun to break locked doors etc. It can operate in any situation!

Daksh can neutralize nuclear, biological and chemical weapons.

Creativity for life time

Know more: <https://www.army-technology.com/projects/remotely-operated-vehicle-rov-daksh/>

5. MOVEMENT DETECTION SYSTEM

Let us build a motion detection system using PIR motion sensor. A **passive infrared sensor** is an electronic sensor that measures infrared light radiating from objects. PIR sensors are mostly used in PIR-based motion detectors. Also, it used in security alarms and automatic lighting applications.

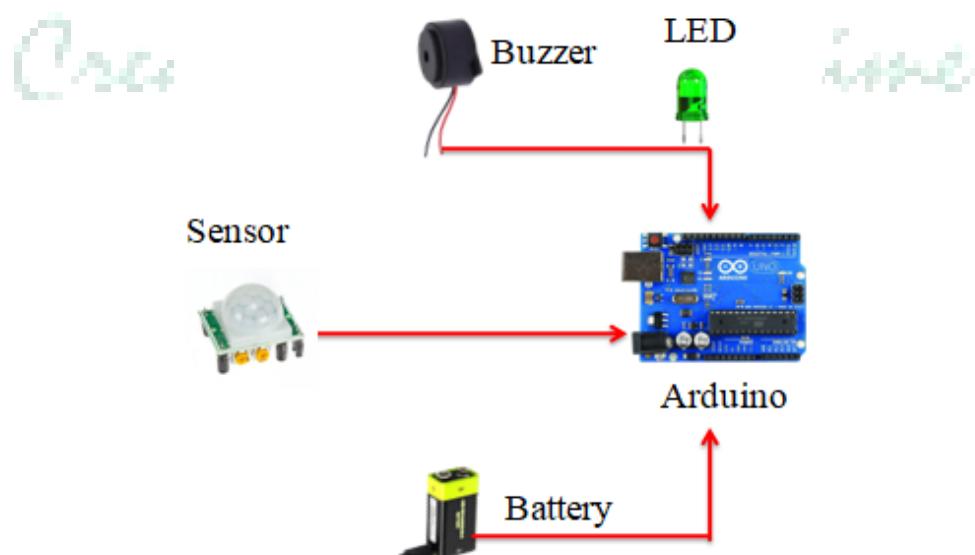
PIR sensors form a vital component of security, automated lighting control, home control, energy efficiency, and other useful systems.

COMPONENTS

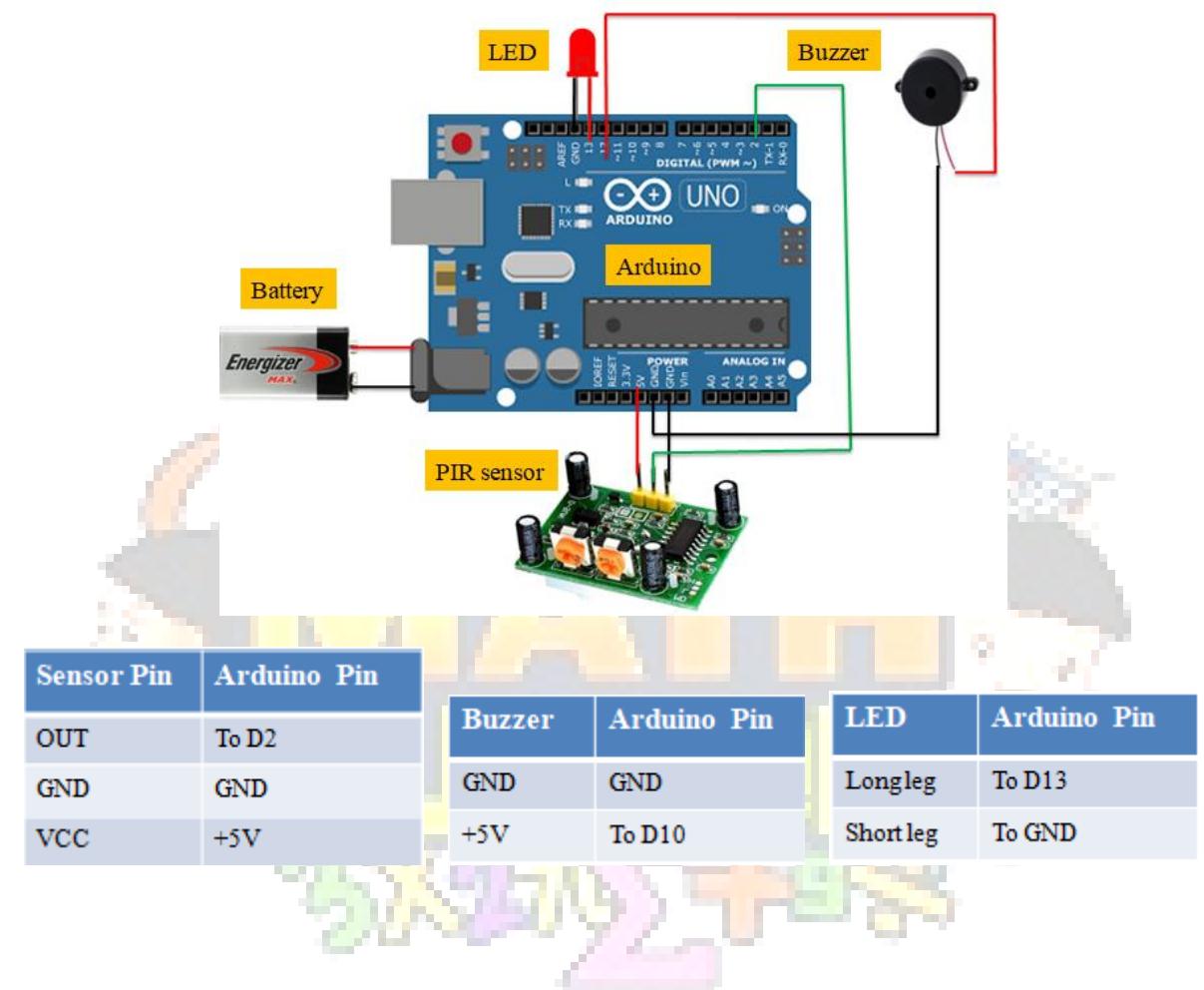
- Arduino UNO
- Buzzer
- PIR Motion Sensor
- Battery
- Jumper wires
- mBlock



BLOCK DIAGRAM

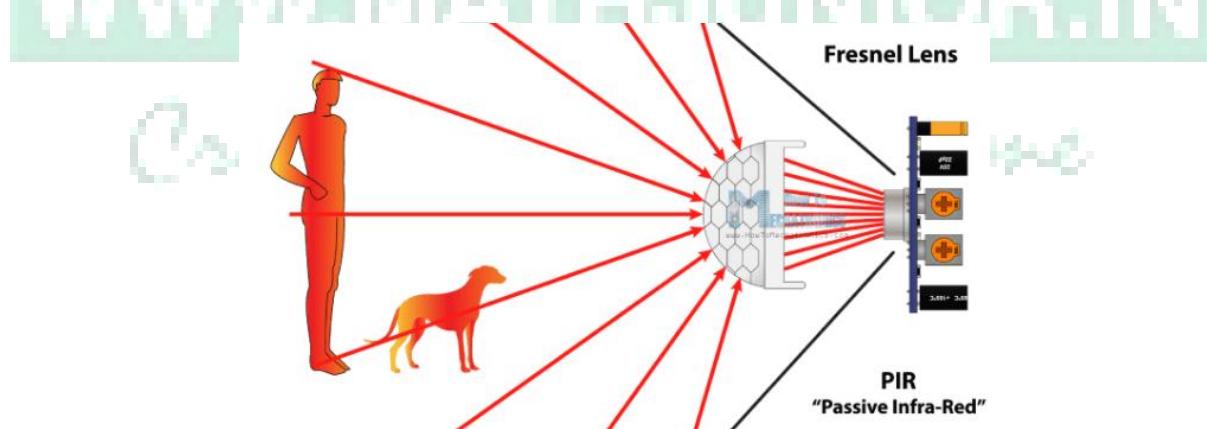


CIRCUIT DIAGRAM



WORKING

How does the sensor work?



PIR is made of a pyroelectric sensor, which is able to detect different levels of infrared radiation. The detector itself does not emit any energy but passively receives it.

Generally, PIR sensor can detect animal/human movement in a requirement range.

It detects infrared radiation from the environment. Once there is infrared radiation from the human body particle with temperature, focusing on the optical system causes the pyroelectric device to generate a sudden electrical signal.

- Connect the circuit to a power supply.
- If there is any movement of a human or an object in the detecting area of the sensor, it receives the IR radiation from the moving identity and generates output current/voltage.
- This output signal causes buzzer to beep.
- As soon as the identity moves out of detecting area, the sensor will not receive any IR radiations and hence, the buzzer stops.

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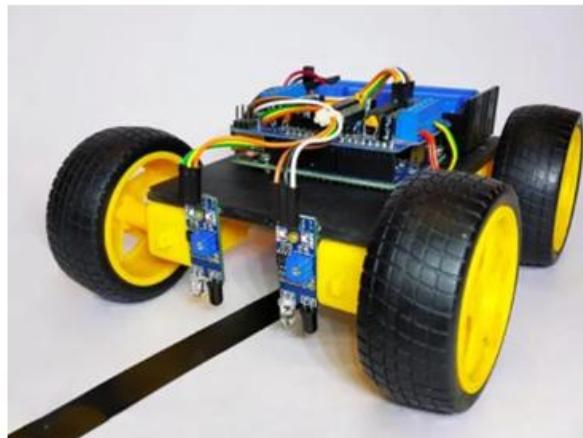
Creativity for life time

6. BLACK LINE FOLLOWER

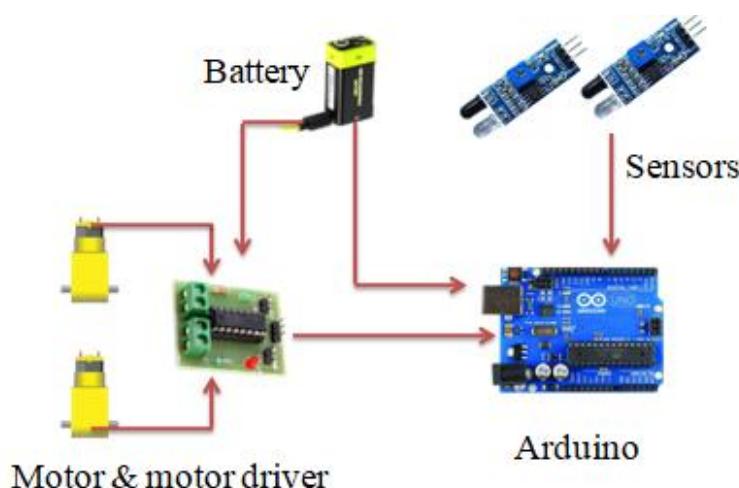
IR sensor is an electronic device that emits light in order to sense some objects in the surrounding environment. An IR sensor can measure the heat of an object as well as detects the motion. In our project, we use IR sensors to build a robotic car that follows white/black line.

COMPONENTS

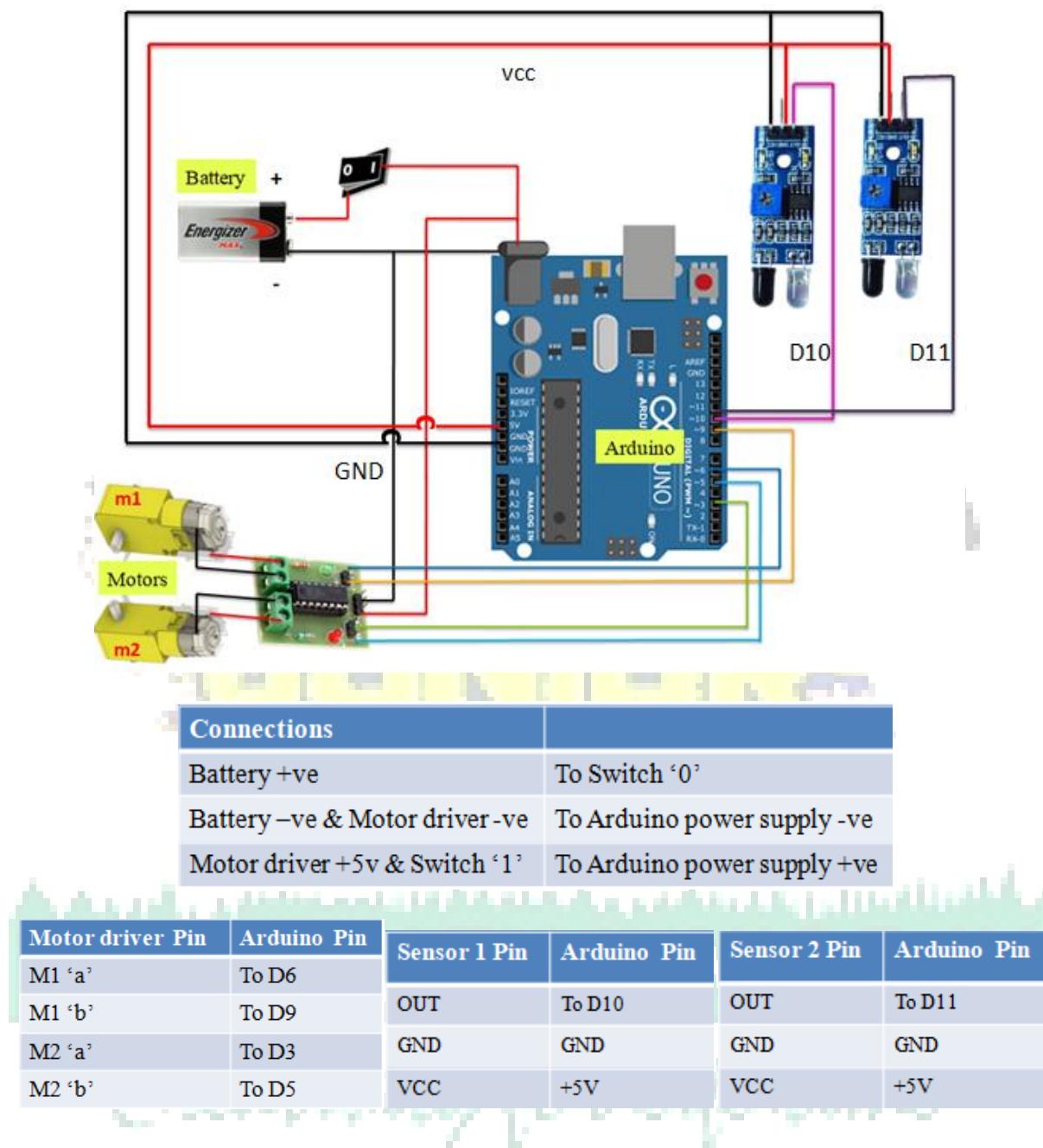
- Arduino UNO R3
- Motor driver – L293D
- IR Sensors
- DC Motors
- Caster wheel
- Battery
- Jumper wires
- mBlock 5 software



BLOCK DIAGRAM



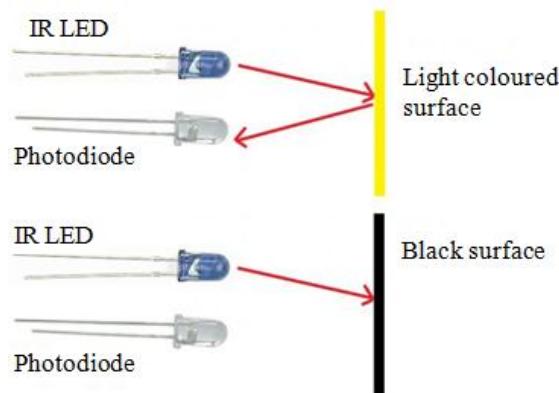
CIRCUIT DIAGRAM



WORKING

How does the sensor work?

The IR sensor has two eyes. Transmitter (IR LED) and Receiver (Photodiode). Generally, black colour absorbs all the light falling on it, and white colour reflects all the light falling on it. IR sensor works on this principle.



IR LED keeps emitting infrared light; the light gets reflected if it falls on any light colored surface. In this case, photodiode receives signal.

Conversely, the light is not reflected if it falls on black line. In this case photodiode will not receive any signal.

- Switch the circuit ON once the connections are made.
- The car starts following the black line and moves forward.
- If left sensor detects black line, the car turns left.
- If right sensor detects black line, the car turns right.
- If both the sensors do not detect any black line, the car stops.
- If both the sensors detect black line, the car moves forward.

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Creativity for life time

7. OBSTACLE AVOIDING ROBOT

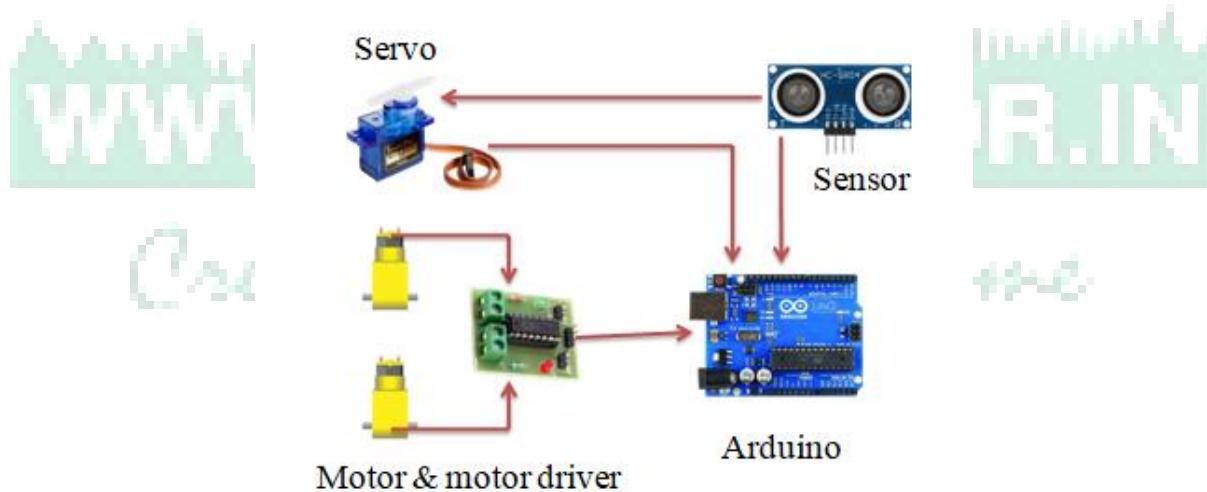
An Obstacle Avoiding Robot is a type of autonomous mobile robot that avoids collision with unexpected obstacles. It is an arduino based robot that uses Ultrasonic range finder sensors to avoid collisions.

COMPONENTS

- Arduino UNO R3
- Motor driver – L293D
- Ultrasonic sensor HC SR04
- DC Motors
- Battery
- Jumper wires
- Servo motor SG90
- mBlock 5 software

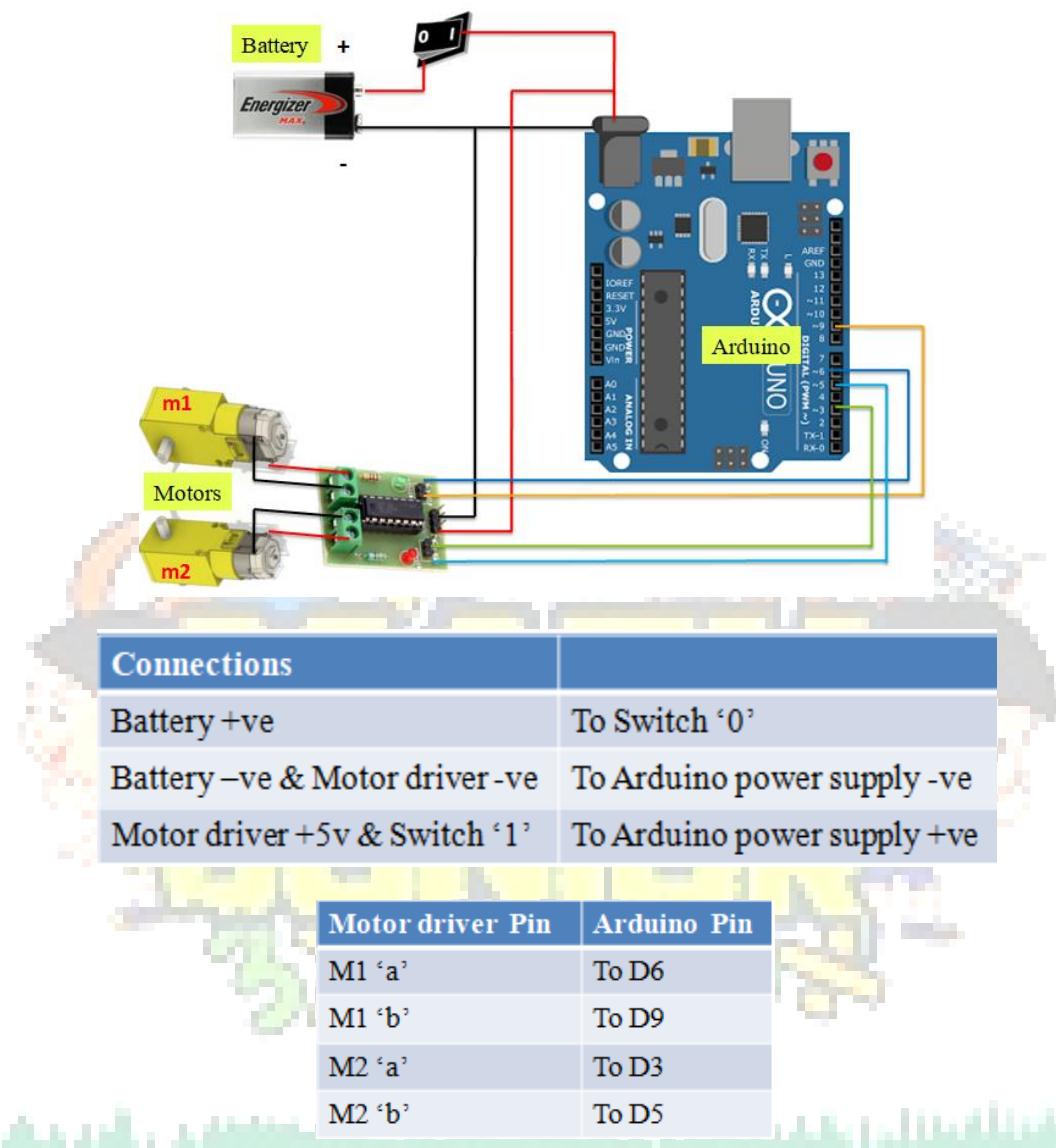


BLOCK DIAGRAM

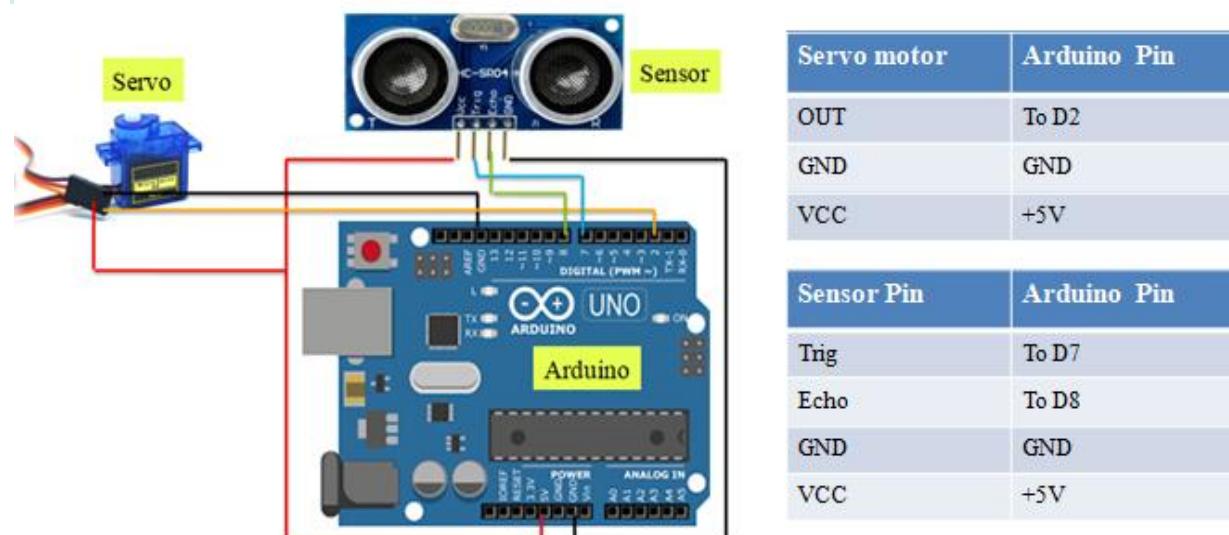


CIRCUIT DIAGRAM

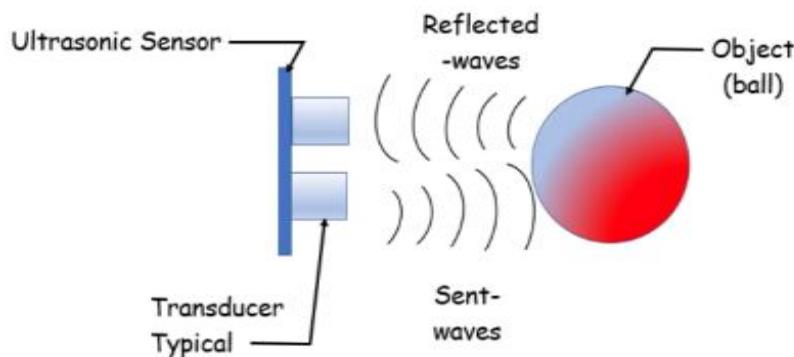
Battery – Arduino – Motor - Motor Driver connection:



Servo – Sensor – Arduino connection:



WORKING



How does the sensor measure distance?

The Ultrasonic sensor has two eyes: **Transmitter and Receiver**. The transmitter (trig) emits sound waves to check if there is an object in front of it. If no object is present, the robot moves forward. If object is present, the transmitted sound waves are reflected back to the receiver (echo). Thereby distance between the robot and the object is measured.

- Switch ON the robot and place it on a flat surface on the ground.
- The sensor checks for distance. If distance > 35 (no obstacle), the car moves forward.
- If distance < 35 (obstacle is present), the car stops.
- Servo motor rotates the sensor head to either left or right and checks for distance again.
- The car takes a turn to the left or right and continues to go forward until next obstacle is encountered.

8. BLUETOOTH CONTROLLED LED LIGHT

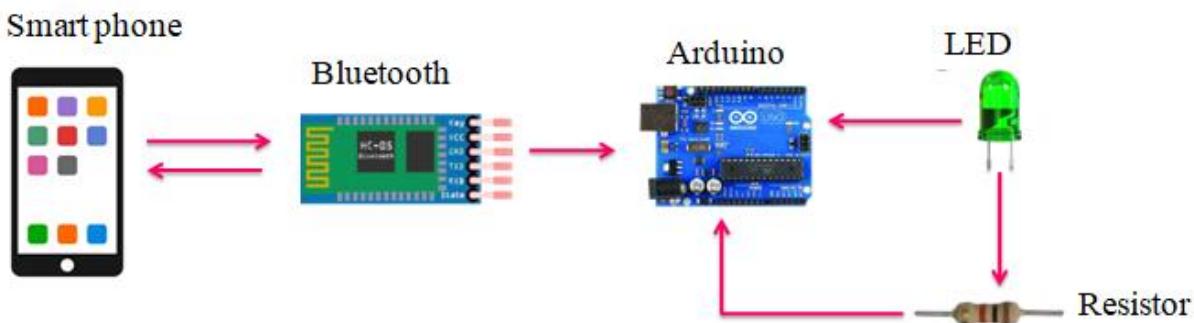
You have seen previously about Bluetooth technology and how it works. It is a wireless technology used to connect devices and share files among them. These devices include Laptop, Tablet, Smartphone, Desktop etc. In this project, You will learn how to control an LED light (ON & OFF) through a smartphone using a bluetooth module.

COMPONENTS

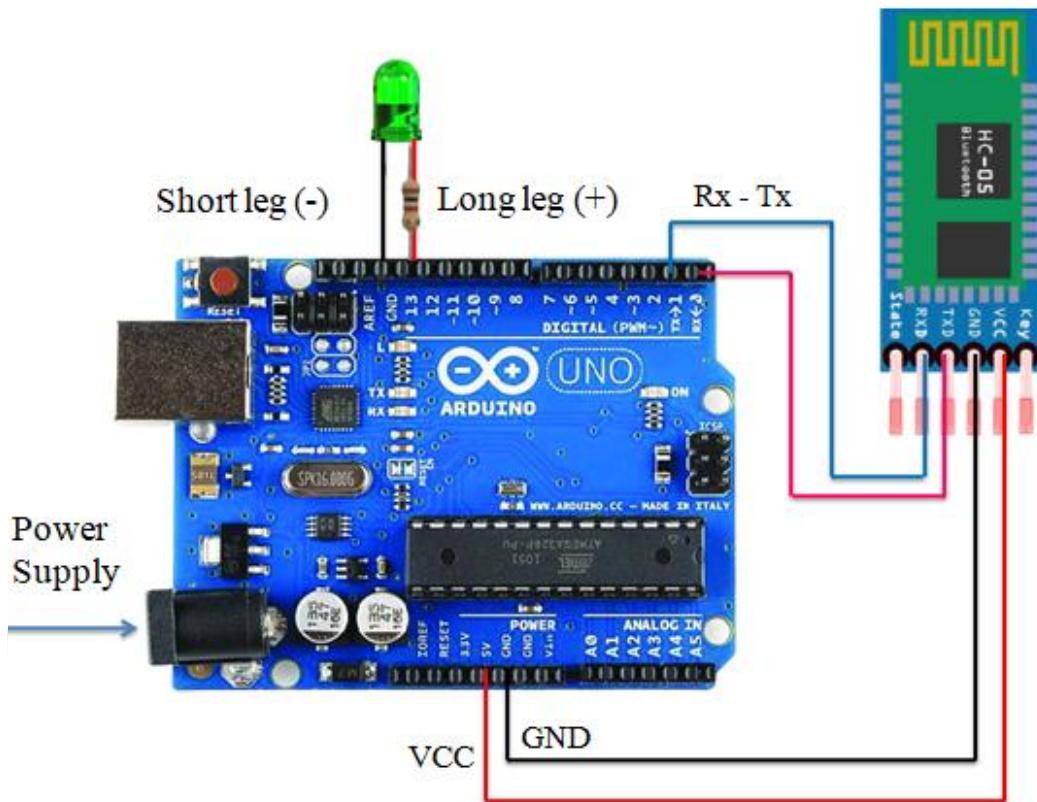
- Arduino UNO
- Jumper wires
- LED
- Bluetooth module
- Android app
- Resistor 1K



BLOCK DIAGRAM



CIRCUIT DIAGRAM



Bluetooth	Arduino	LED	Resistor	Arduino
Tx	To Rx (D0)	Long leg	To 1 side	
GND	To GND	Short leg		To GND
Rx	To Tx (D1)		Other side	To D13
VCC	To +5V			

WORKING

- Install ‘Arduino Bluetooth Controller’ app on your phone.
- Make the connections as shown and connect your phone to the bluetooth module.
- Supply power to the circuit and open the app on the phone.
- Select the mode of connection as Terminal mode.

- Now. You can enter your command in the terminal. If you send the value ‘1’ to the bluetooth, LED will be ON.
- If you type the value ‘0’ and send to bluetooth, the LED will go OFF.
- You can also operate the LED on Switch mode.



This is the Terminal mode of the app.

OFF

As you can see, when you send ‘1’, LED will be ON



When you send ‘0’, LED will be OFF.



Not only 0 & 1, you can configure this for any 2 commands like:

‘on’ & ‘off’
‘yes’ & ‘no’
‘A’ & ‘B’
‘1’ & ‘2’

And so on.

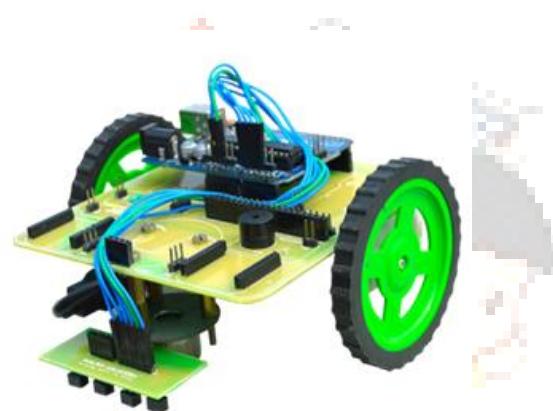
Creativity for life time

9. BLUETOOTH ROBOTIC CAR

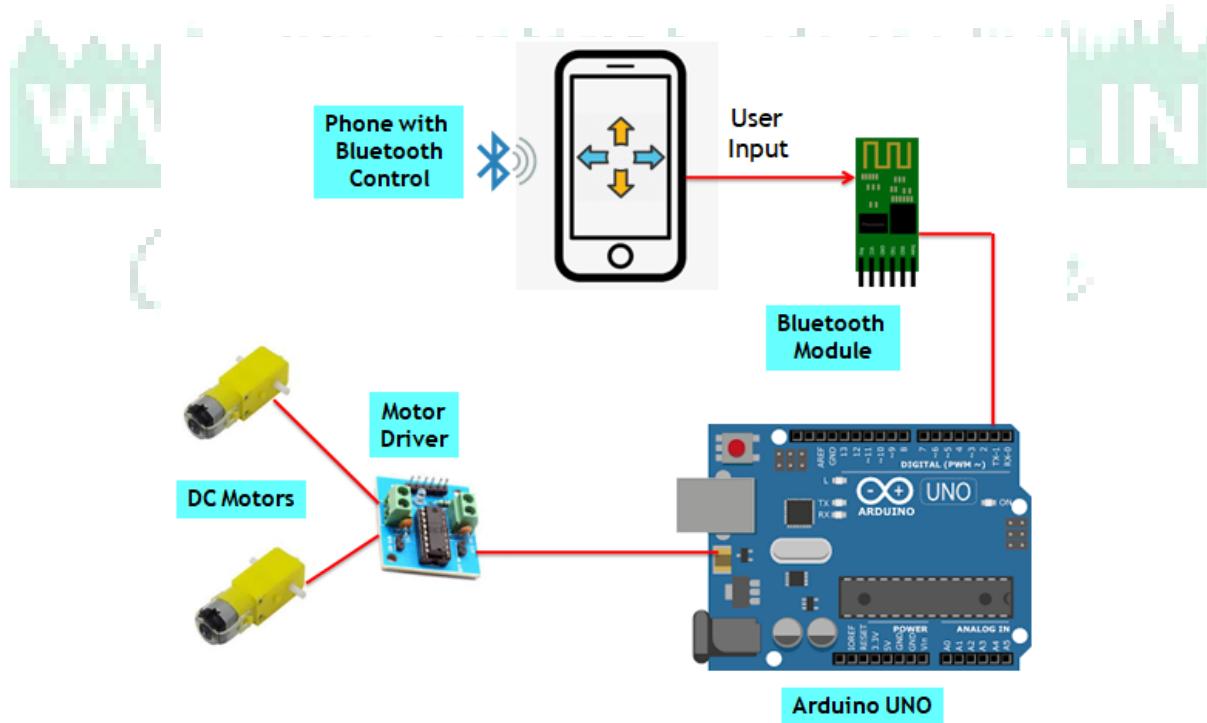
Let us learn how to make a wireless bluetooth controlled car using arduino. This car is controlled by a smartphone via bluetooth. The robotic car can move forward, backward, left, right and stop.

COMPONENTS

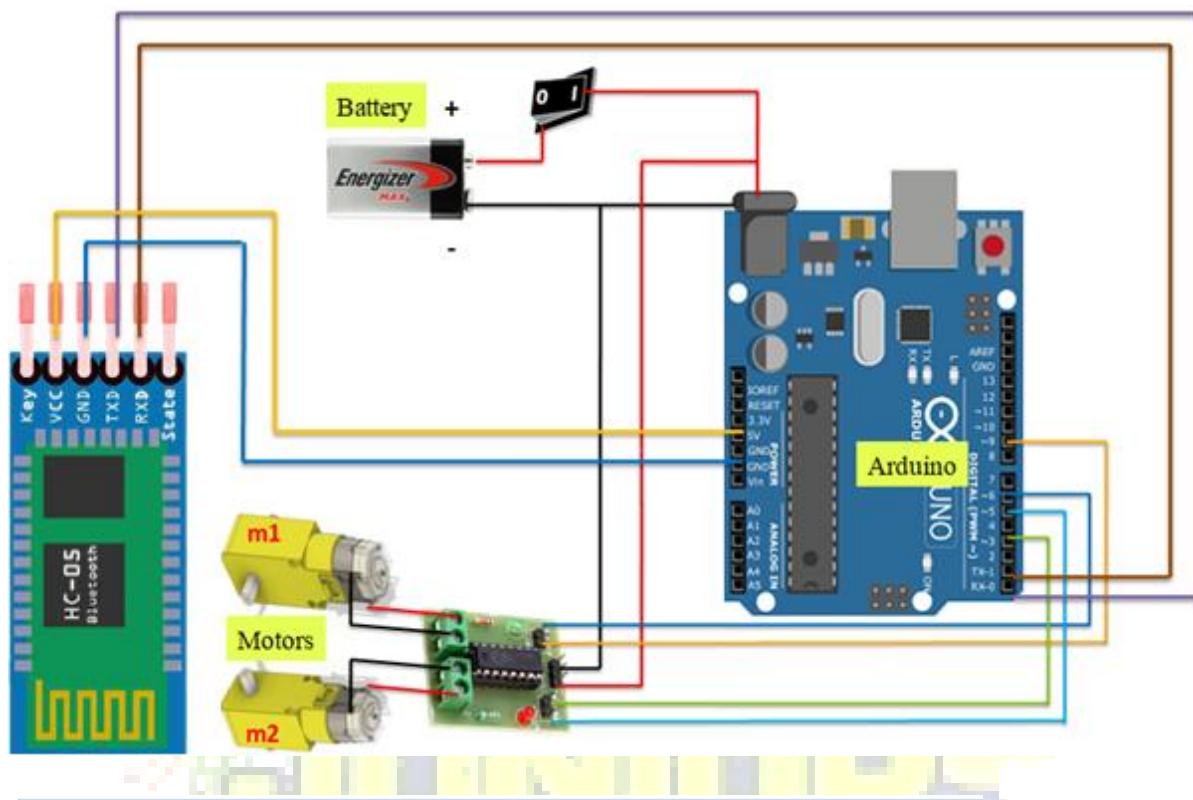
- Arduino UNO/R3
- Motor driver – L293D
- Bluetooth module HC 05
- DC Motors
- Battery
- Jumper wires
- Smart phone
- mBlock 5 software



BLOCK DIAGRAM



CIRCUIT DIAGRAM



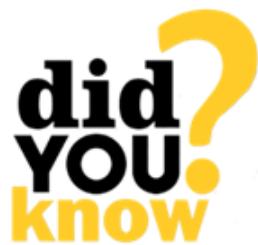
Connections	
Battery +ve	To Switch '0'
Battery -ve & Motor driver -ve	To Arduino power supply -ve
Motor driver +5v & Switch '1'	To Arduino power supply +ve

Motor driver Pin	Arduino Pin	Bluetooth Pin	Arduino Pin
M1 'a'	To D6	RXD	To TX (D1)
M1 'b'	To D9	TXD	To RX (D0)
M2 'a'	To D3	GND	GND
M2 'b'	To D5	VCC	+5V

WORKING

Install the '**Arduino Bluetooth Controller**' app on your phone. Make the connections as shown above and switch on the bluetooth car to test its operations.

- Open the Arduino Bluetooth Controller app on your phone.
- Connect smart phone & bluetooth module via bluetooth.
- Press any key (up, down, right, left arrow) on the app.
- Bluetooth module receives this signal & updates the arduino about what action to be taken.
- Arduino in turn causes the motor to rotate accordingly (forward, backward, left, right or stop).



AGRICULTURAL BOTS



Agricultural robots automate slow, repetitive and dull tasks for farmers, allowing them to focus more on improving overall production yields. From **drones** to **autonomous tractors** to **robotic arms**, the technology is being deployed in creative and innovative applications.

Some of the most common robots in agriculture are used for:

- ✓ Harvesting and picking
- ✓ Weed control
- ✓ Autonomous mowing, pruning, seeding, spraying and thinning
- ✓ Sorting and packing

Know more: <https://www.automate.org/blogs/robotics-in-agriculture-types-and-applications>

10. FIRE FIGHTING BOT

Fire fighting is an important job but it is very dangerous occupation. Due to that, Robots are designed to find a fire, before it rages out of control. It could be used to work with fire fighters to reduce the risk of injury to victims.

This would improve the efficiency of fire fighters and would also prevent them from risking human lives. In this project, we are building a Fire Fighting Robot using Arduino and flame sensor.

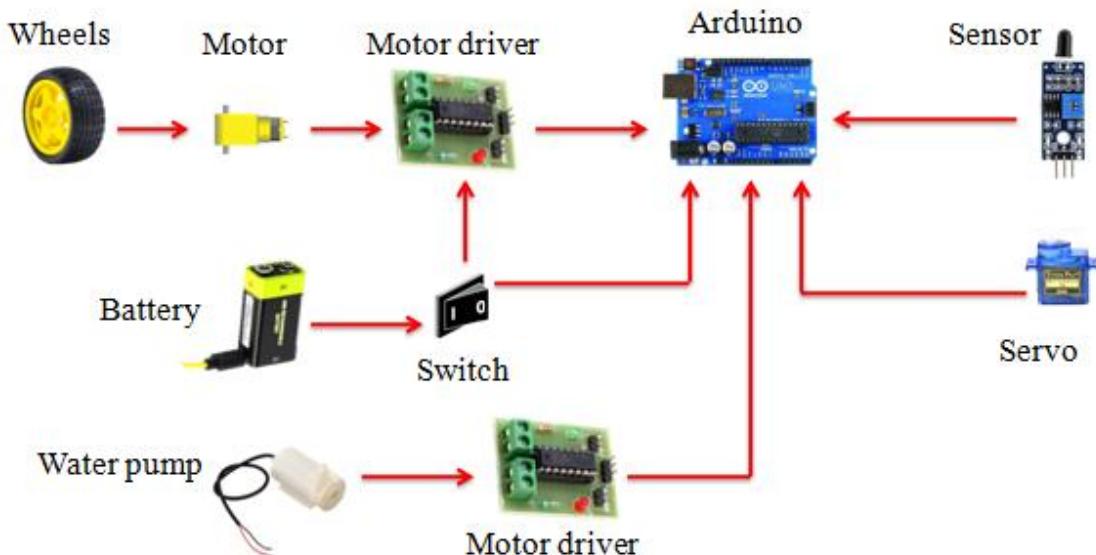
COMPONENTS

- Switch
- Arduino UNO
- Motor driver L293
- DC motors
- Flame sensor
- Servo motor
- Acrylic chassis
- Screws and nuts
- Container
- Jumper wires
- Battery
- Wheels
- Water pump with pipe
- Mini breadboard



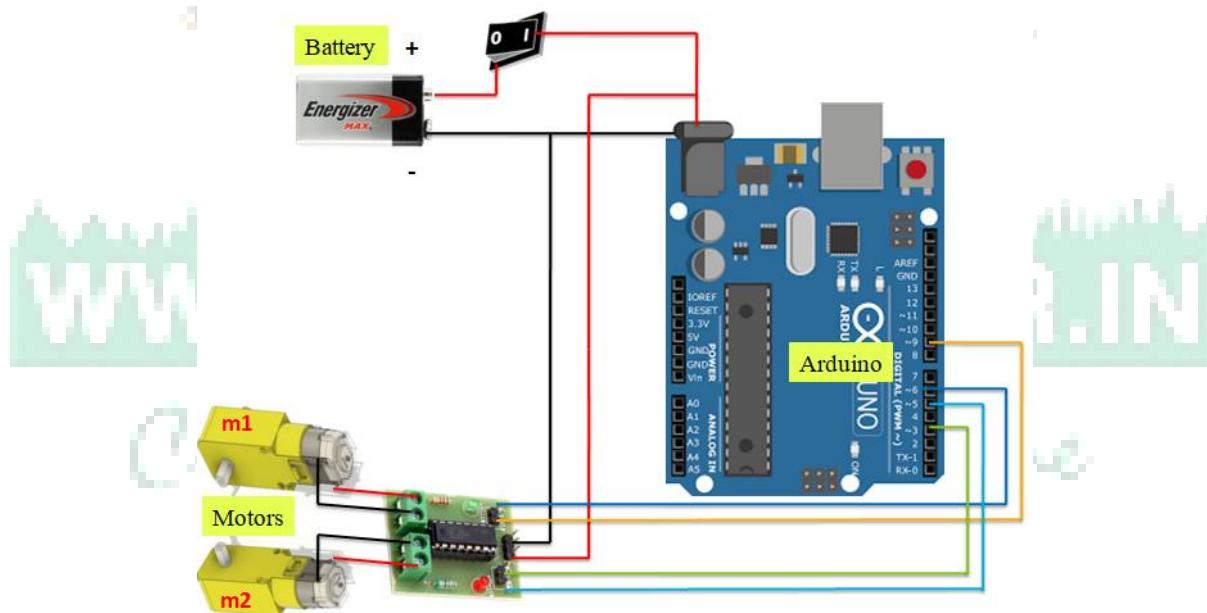
This robot uses flame sensor will automatically sense the fire and start the water pump. A simple robot using Arduino that could move towards the fire and pump out water around it to put down the fire. It is a very simple robot that would teach us the underlying concept of robotics.

BLOCK DIAGRAM



CIRCUIT DIAGRAM

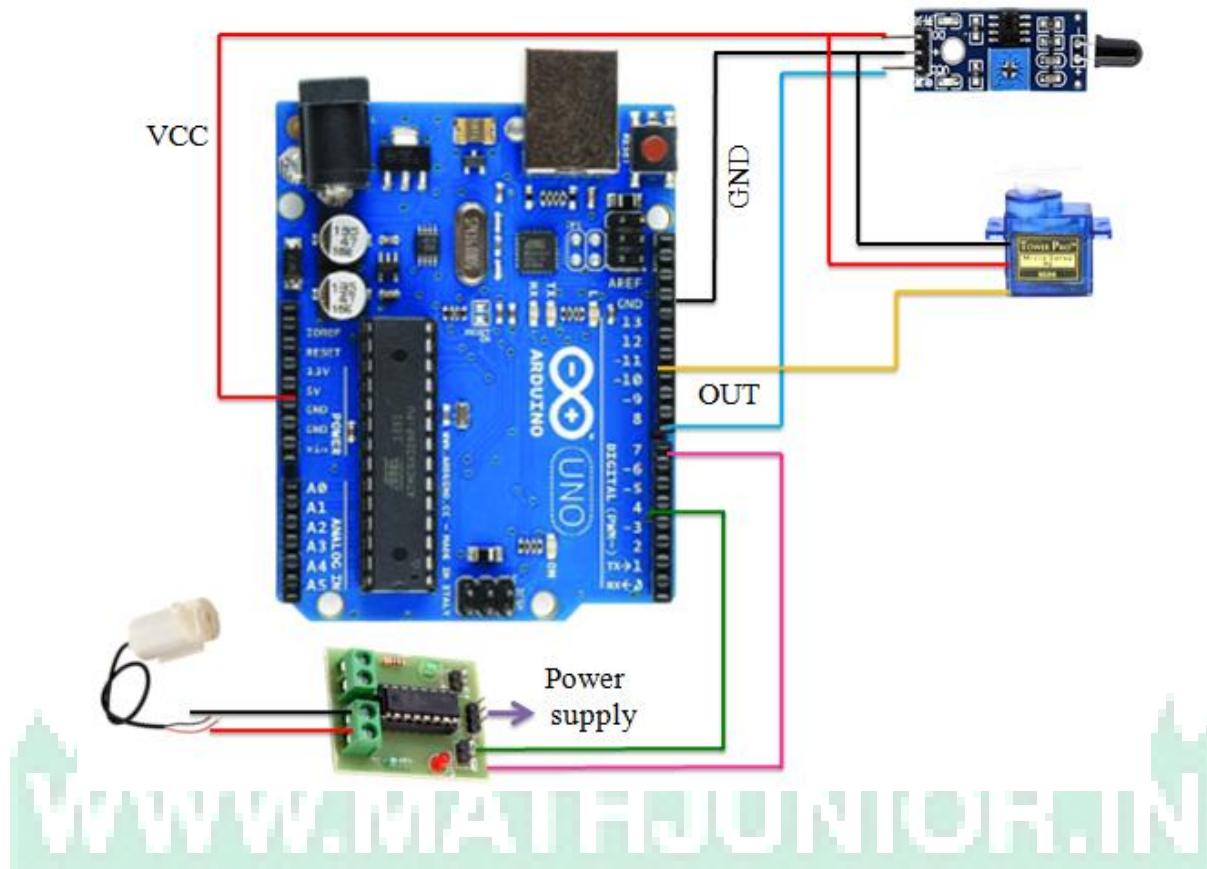
Motor – motor driver – battery – switch – arduino connections:



Connections	
Battery +ve	To Switch '0'
Battery -ve & Motor driver -ve	To Arduino power supply -ve
Motor driver +5v & Switch '1'	To Arduino power supply +ve

Motor driver Pin	Arduino Pin
M1 'a'	To D6
M1 'b'	To D9
M2 'a'	To D3
M2 'b'	To D5

Sensor – servo – pump – motor driver – arduino connections:



Sensor	Arduino
VCC	To VCC
GND	To GND
OUT	To D8

Servo	Arduino
VCC	To VCC
GND	To GND
OUT	To D11

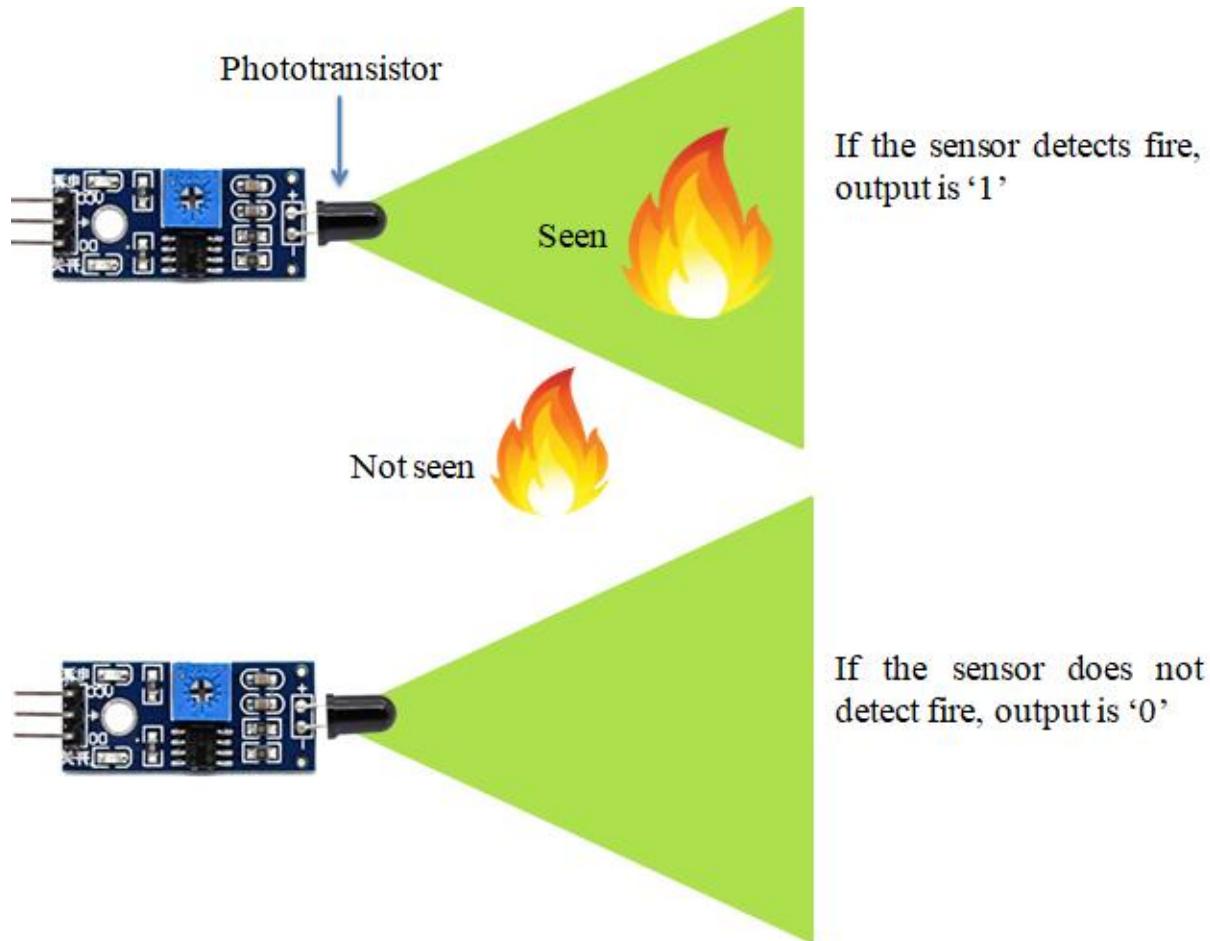
Motor driver	Arduino
Pump 'a'	To D4
Pump 'b'	To D7

WORKING

How does the flame sensor work?

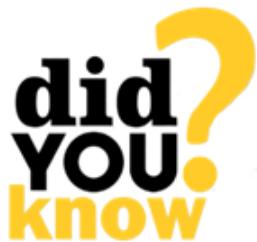
A Flame Sensor module can detect a fire source or any other bright light sources. This sensor basically detects IR (Infrared) light

wavelength between 760 nm – 1100 nm that is emitted from the fire flame or light source. The flame sensor comes with a YG1006 Phototransistor sensor which has a high speed and high sensitivity.



Phototransistor has an Emitter (long leg +ve) and a Collector (short leg -ve). When the transistor detects IR light, current is conducted between Emitter and Collector and therefore, output is produced.

- Make the circuit connections as shown and supply power.
- The flame sensor tries to detect fire in front of it.
- If there is any fire, the car goes forward and pours water on it until it puts out the fire.
- Once the fire is put out, the car stops pumping water.



SNAKEBOT – SEARCH & RESCUE



“Snakebot” - a robot that is built to ‘slither’ in a flexible manner similar to that of a real snake. It comes in various shapes and sizes making it ideal for getting into tight spaces.

It has the ability to climb tree trunks and change its shape. It continues to work even if a part of its body is destroyed!

Snakebots are widely used in medical field to perform minimally invasive surgeries.



In 2017, a part of Mexico city was violently shook with an earthquake. Hundreds of people died and buildings collapsed.

The head of the robot contained lights and a video camera.

Snake bot was sent into the collapsed buildings to search and rescue the survivors within the building.

This robot is developed by Carnegie Mellon University, it received **“Ground Robot of the Year”** award in 2017 for its successful **Disaster Rescue Mission**.

Know more: <https://www.zdnet.com/article/snakebot-named-ground-rescue-robot-of-the-year/>